Species Diversity, 2006, **11**, 183–190

Studies on the Zoarcidae (Teleostei: Perciformes) of the Southern Hemisphere. XII. Two New Lycodine Species from off Peru

M. Eric Anderson

South African Institute of Aquatic Biodiversity, Private Bag 1015,
Grahamstown 6140, South Africa
E-mail: E.Anderson@ru.ac.za

(Received 25 April 2006; Accepted 4 July 2006)

Sixteen deepwater eelpout species were collected from a trawl fishery survey conducted by a joint Japanese-Peruvian team between 1998 and 2003 off Peru. Two are described here as new to science. *Lycenchelys imamurai* sp. nov. is distinguished from congeners in the area by its unique lateral line configuration, two pelvic-fin rays, lack of head and nape scales, head pore pattern, and counts of the axial skeleton. *Pachycara dolichaulus* sp. nov. is distinguished from its congeners in the area by its lateral line configuration, low vertebral count, dorsal-fin origin, five postorbital pores, and lack of nape scales.

Key Words: Teleostei, Perciformes, Zoarcidae, eelpout, *Lycenchelys imamurai* sp. nov., *Pachycara dolichaulus* sp. nov., southeastern Pacific Ocean, Peru.

Introduction

During 1998–2003 a joint Japanese-Peruvian trawl fishery survey was conducted by the Japan Deep-Sea Trawlers Association and the Instituto del Mar del Peru. Sixteen species of deep-sea eelpout (Zoarcidae) were collected, two of which were determined to be new to science and are described herein. Both species are lycodines as defined by Anderson (1994) and both belong in genera previously reviewed from southeastern Pacific waters by Anderson (1989, 1995) and Anderson and Bluhm (1997), namely *Lycenchelys* Gill, 1884 and *Pachycara* Zugmayer, 1911. *Lycenchelys* and *Pachycara* currently include 59 and 19 eelpout species, respectively (Anderson and Fedorov 2004), with a few undescribed species of both genera in collections known to the author. All the species of both genera occur in the deep-sea, from upper bathyal to abyssal depths.

All specimens of the two new species were collected in 1999 and 2000 by bottom trawls from the Japanese fisheries research vessel *Shinkai-Maru*. Specimens were procured by staff and students of the Graduate School of Fisheries Sciences, Hokkaido University, Hakodate, Japan, where they are deposited. Ten specimens of the new *Lycenchelys* species were obtained from seven stations off northern Peru. A single specimen of the new *Pachycara* species was obtained at a station west of Trujillo, Peru.

Materials and Methods

Measurements were made with dial calipers to the nearest 0.1 mm. Counts of the axial skeleton were made from radiographs on deposit at Hokkaido University's Laboratory of Marine Biology and Biodiversity (Systematic Ichthyology), Graduate School of Fisheries Sciences (HUMZ), in Hakodate. Definitions of character states and systematic methodology follow those of Anderson (1982, 1994, 1995). Lateral line terminology follows Andriashev (1954, fig. 142). Abbreviations in the text are: HL, head length; SL, standard length.

Taxonomic Account

Lycenchelys imamurai sp. nov.

(Figs 1, 2)

Material examined. Holotype: HUMZ 175168 (male; 212 mm SL), SW of Punta Negra, 06°39.4′S, 81°04.6′W to 06°41.3′S, 81°04.9′W, 675–714 m, *Shinkai-Maru*, 1 May 2000. Paratypes: HUMZ 175281 (male; 156 mm SL), off Pacasmayo, 07°51.8′S, 80°36.9′W to 07°50.5′S, 80°37.7′W, 1172–1187 m, *Shinkai-Maru*, 28 April 2000; HUMZ 175214 (female; 142 mm SL) and HUMZ 175219 (male; 182 mm SL), W of Trujillo, 08°22.7′S, 80°15.3′W to 08°21.7′S, 80°16.0′W, 739–746 m, *Shinkai-Maru*, 26 April 2000; HUMZ 173720 (male; 165 mm SL), W of Trujillo, 08°32.6′S, 80°12.2′W to 08°31.1′S, 80°12.7′W, 945–971 m, *Shinkai-Maru*, 25 April 2000; HUMZ 174665 (female; 155 mm SL), SW of Trujillo, 09°03.7′S, 80°00.7′W to 09°05.3′S, 80°00.8′W, 870–909 m, *Shinkai-Maru*, 24 April 2000; HUMZ 167046 (male; 173 mm SL), SW of Trujillo, 09°18.5′S, 79°39.4′W to 09°16.6′S, 79°39.1′W, 481–496 m, *Shinkai-Maru*, 30 July 1999; HUMZ 174883 (male; 156 mm SL), HUMZ 174884 (female; 153 mm SL), and HUMZ 174888 (male; 165 mm SL), SW of Trujillo, 09°35.2′S, 79°39.6′W to 09°33.7′S, 79°39.5′W, 741–810 m, *Shinkai-Maru*, 23 April 2000.

Diagnosis. A species of *Lycenchelys* as defined by Anderson (1994, 1995) with the following combination of characters: vertebrae 21–22+91–96; lateral line single, coursing ventrally on abdomen and rising to mediolateral position above anus; pelvic-fin rays 2; no scales on nape or cheeks; occipital and interorbital pores absent; postorbital pores 3–4; suborbital pores 7+2; dorsal-fin origin associated with vertebrae 3–4; lower gill rakers 14–17.

Counts and proportions (holotype first, followed in parentheses by range of paratypes). Vertebrae 21+91=112 (21–22+91–96=112–118); dorsal-fin rays 107 (107–113); anal-fin rays 92 (92–98); caudal-fin rays 11 (11); pectoral-fin rays 15 (14–16);

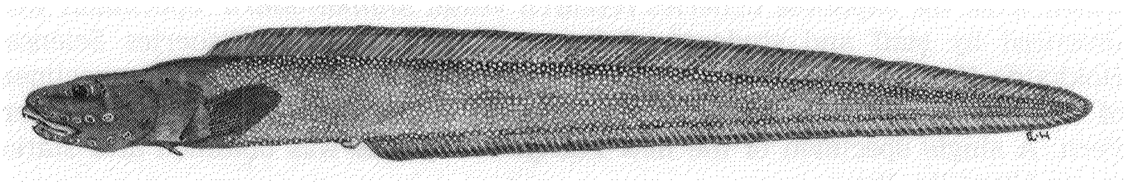

Fig. 1. *Lycenchelys imamurai* sp. nov., holotype, 212 mm SL, HUMZ 175168, off Peru.

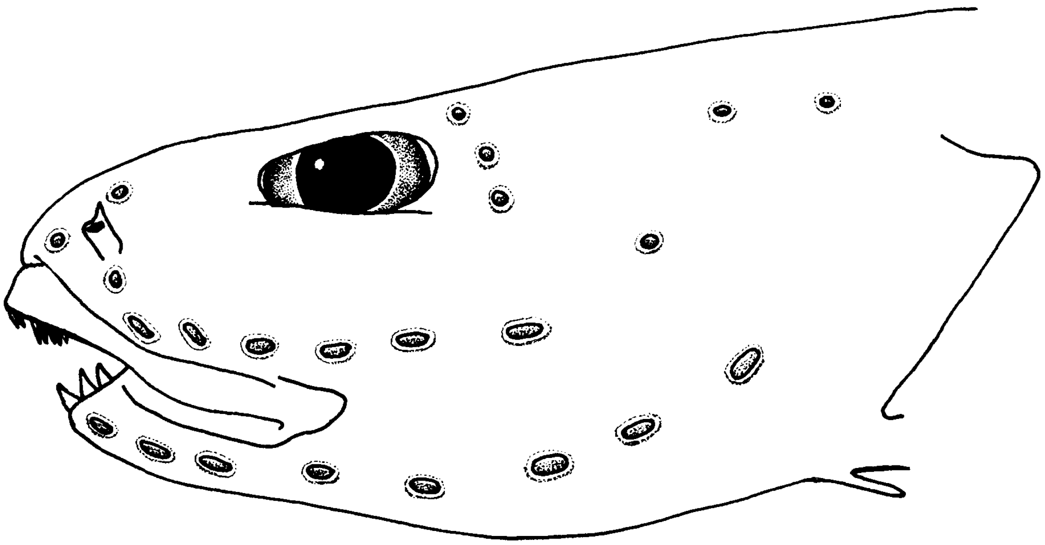

Fig. 2. *Lycenchelys imamurai* sp. nov., holotype, 212 mm, SL, HUMZ 175168, off Peru. Diagram showing cephalic lateralis pore system.

pelvic-fin rays 2 (2); vomerine teeth 0 (0); palatine teeth 0 (0); gill rakers 2+15=17 (1–2+14–17=16–18); branchiostegal rays 6 (6); pseudobranch filaments 5 (3–4). Following proportions as percent SL: head length 16.3 (12.5–16.3); head width 7.2 (5.1–8.2); head depth 7.3 (5.5–7.7); postorbital head length 9.0 (7.4–9.8); pectoral-fin length 7.3 (7.0–8.3); predorsal length 16.4 (14.0–17.4); preanal length 31.3 (28.4–33.1); body depth 7.3 (5.9–7.3); gill slit length 5.3 (4.4–5.9). Following proportions as percent HL: head width 44.2 (32.4–51.2); head depth 44.8 (40.7–49.7); postorbital head length 55.2 (57.2–59.9); upper jaw length 46.5 (32.9–47.1); pectoral-fin length 44.8 (46.5–59.8); snout length 20.5 (19.3–28.8); eye diameter 19.4 (19.3–24.9); gill slit length 32.1 (30.2–37.3); interorbital width 6.7 (5.2–9.0); interpupillary width 20.5 (20.0–28.8); pelvic-fin length 16.5 (16.5–28.2); caudal-fin length 5.8 (4.8–8.5). Pectoral base/length ratio: 46.5 (37.8–50.4).

Description. Known from three immature females, six immature males, and one subadult male (holotype). Head moderately elongate, ovoid; dorsal profile more dorsoventrally depressed in holotype than in juveniles. Sexual dimorphism in head length not detected in these young fish, but head somewhat broader in males than in females owing to development of adductor mandibulae muscles (Toyoshima 1985, fig. 33; Mecklenburg *et al.* 2002). Head width 32.4–41.8% HL (mean value=37.0) in females, 37.3–51.2% HL (mean value=38.0) in males. Scales present anteriorly on body to vertical through upper end of gill slit; no scales on nape or head. Scales present on unpaired fins to about 75% of their height posteriorly in holotype, scattered on pectoral base and in pectoral axil; scales on abdomen anteriorly to pelvic base. Eye rounded, entering dorsal profile of head. Gill slit extending ventrally to opposite lowermost pectoral ray or slightly below it. Opercular flap at upper end of gill slit well developed, angular, extending forward about three-quarters eye diameter, sometimes with concave dorsal margin. Pectoral-fin origin well below body midline, insertion on abdomen; posterior margin of fin wedge-shaped, ray tips exserted, more so ventrally; rays 5–7 longest, lowermost 5–6 rays thickened.

Mouth inferior, upper jaw extending to middle of eye (juveniles) or to its posterior quarter (holotype); posterior end hidden in deep, fleshy pocket. Upper jaw relatively longer in males (39.0–47.1% HL, mean value=43.9%) than in females (32.9–36.2% HL, mean value=35.1%). Nostril tube not reaching upper lip. Upper lip thin, broadly adnate to snout tip. Labial lobe of lower jaw thick, stronger in holotype than in juveniles. Oral valve weak, not reaching edge of vomer and coalesced with lateral margin of palate at rictus. Females with more jaw teeth than males; dentary with 26–29 teeth in females, 18–26 in males; premaxilla with 17–26 teeth in females, 16–22 in males. Palate without teeth.

Cephalic lateralis system (Fig. 2) with usually three postorbital pores arising from frontal, pterotic, and lateral extrascapulars (four pores on right side of HUMZ 175281). Two pairs of anterior supraorbital (nasal) pores, one set anteromesial to nasal tube, the other posteromesial. Nine suborbital pores, seven arising from ventral ramus of bone chain below eye, and two from ascending ramus behind eye just ventral to first postorbital pore. Eight preoperculomandibular pores, four arising from dentary, one from anguloarticular, and three from preopercle. Interorbital and occipital pores absent. Body lateral line of superficial neuromasts originating just behind posteriormost postorbital pore, coursing ventrally on abdomen, then rising to mediolateral position above anus (Fig. 1).

Dorsal fin origin on vertical through pectoral base, associated with vertebrae 3–4, usually 4, with no free supraneurals. Anal fin origin associated with ultimate precaudal vertebra, with three ray-bearing pterygiophores inserted anterior to haemal spine of first caudal vertebra. Pterygiophore of last dorsal ray associated with fourth preural vertebra; pterygiophore of last anal ray associated with second preural vertebra. Caudal fin with two epural, 4–5 upper hypural, and 4–5 lower hypural rays.

One or two (in four specimens) acute gill rakers on upper limb of first arch; ventralmost 6–7 rakers on lower limb also acute, middle rakers with squared-off tips. Pseudobranch filaments long. Pyloric caeca two small nubs.

Fresh coloration uniformly black, eye blue. Lining of orobranchial chamber and peritoneum black. Stomach pale (unpigmented) in all specimens.

Etymology. Named in honor of Dr Hisashi Imamura, Hokkaido University Museum, Japan, for his many contributions to ichthyology and help during the author's visit to Hakodate during 2005–2006.

Remarks. *Lycenchelys imamurai* appears to be a southern sister-species of *L. crotalinus* (Gilbert, 1890) (Toyoshima 1985; Anderson 1995). Characters the two species share in combination not shared by other eastern Pacific congeners that suggest this are the absence of vomerine and palatine teeth, the lack of occipital and interorbital pores, a usual suborbital pore pattern of 7+2, a high number of gill rakers on the lower limb, and the characteristic lateral line configuration. The two species differ in *L. imamurai* having two pelvic-fin rays (vs. three in *L. crotalinus*), a more advanced dorsal-fin origin (first pterygiophore associated with vertebrae 3–4 vs. 4–6 in *L. crotalinus*), the lateral line rising to a mediolateral position above the anus (vs. at mid-tail in *L. crotalinus*), usually three postorbital pores (vs. usually two in *L. crotalinus*), and scales absent on the nape and head (vs. their presence, at least on the nape, in *L. crotalinus* at comparable sizes). This last character is tentatively accepted despite only a single subadult being known of *L. imamurai*, but specimens of *L. crotalinus* of the same size do have head and nape squamation

(Anderson 1995).

Pachycara dolichaulus sp. nov.
(Figs 3–5)

Material examined. Holotype: HUMZ 167323 (male; 244 mm SL), W of Trujillo, 08°18.8′S, 80°18.2′W, 666–718 m, *Shinkai-Maru*, 3 Aug. 1999.

Diagnosis. A species of *Pachycara* as defined by Anderson (1989, 1994) with the following combination of characters: vertebrae 22+71=93; postorbital pores 5; nostril tube extending well forward of upper lip; mediolateral branch of lateral line originating posterior to vertical through pectoral-fin margin; dorsal-fin origin associated with second vertebra; scales absent on head and nape.

Counts and proportions. Vertebrae 22+71=93; dorsal-fin rays 89; anal-fin rays 74; pectoral-fin rays 17; pelvic-fin rays 3; caudal-fin rays 10; vomerine teeth 7; palatine teeth 12/12; gill rakers 3+10=13; branchiostegal rays 6; pseudobranch filaments 4. Following proportions as percent SL: head length 16.6; head width 7.9; head depth 9.0; postorbital head length 9.6; pectoral-fin length 10.4; predorsal length 18.3; preanal length 36.7; body depth 10.7; gill slit length 5.9. Following proportions as percent HL: head width 47.5; head depth 54.5; postorbital head length 58.2; upper jaw length 29.5; nasal tube length 11.4; pectoral-fin length 62.9; snout length 20.8; eye diameter 20.1; gill slit length 35.4; interorbital width 7.4; interpupillary width 25.5; pelvic-fin length 15.4; caudal-fin length 19.8. Pectoral base/length ratio 42.5.

Description. Head ovoid, snout tip steeply sloping. Scales on body extending

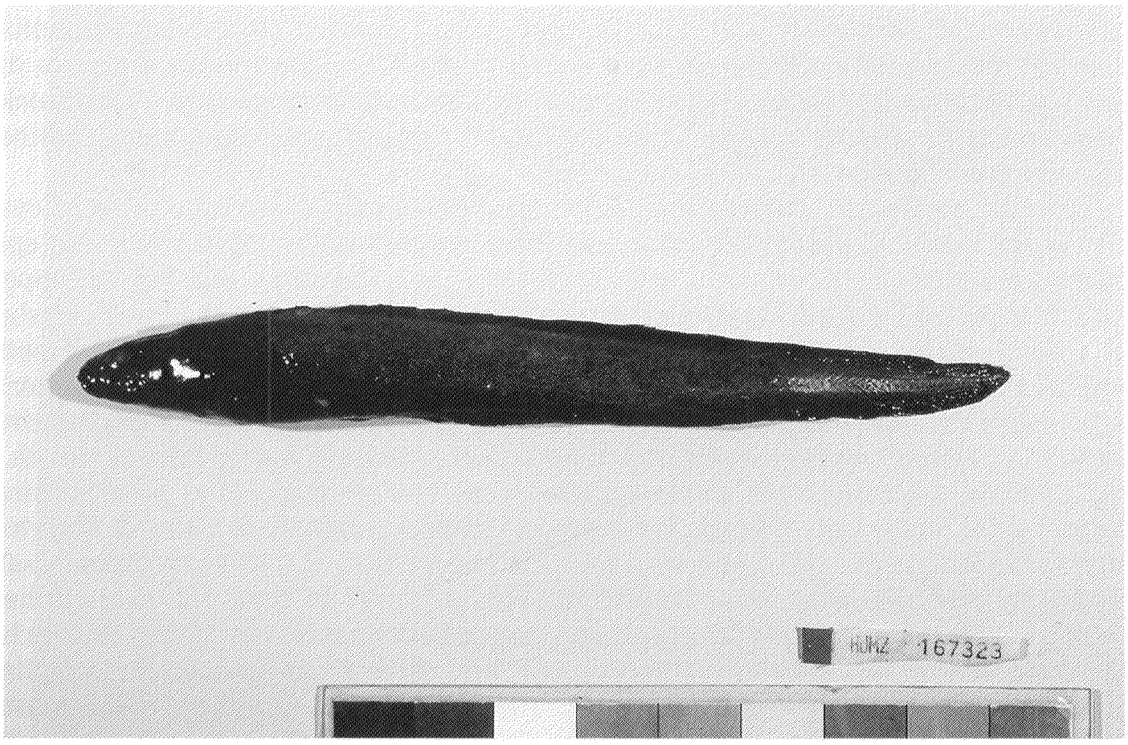

Fig. 3. *Pachycara dolichaulus* sp. nov., holotype, 244 mm SL, HUMZ 167323, off Peru. Fresh specimen.

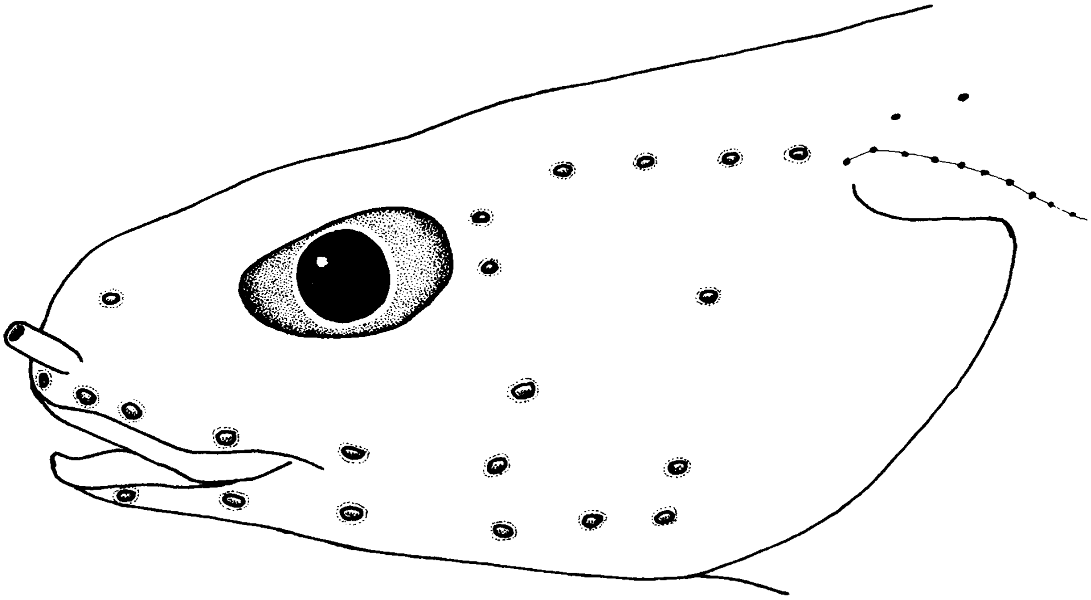

Fig. 4. *Pachycara dolichaulus* sp. nov., holotype, 244 mm SL, HUMZ 167323, off Peru. Diagram showing cephalic lateralis pore system.

anteriorly to vertical through middle of pectoral fin; no scales on head, nape, pectoral fin, pectoral axil, or midventral line of abdomen; scales present on dorsal and anal fins to 90% of their height posteriorly. Eye rounded, not entering dorsal profile of head. Gill slit extending ventrally to opposite third from lowermost pectoral ray (ray 14). Opercular flap at upper end of gill slit squared off, gill slit extending forward about half eye diameter then coursing dorsally about one-quarter eye diameter. Pectoral fin wedge-shaped, middle rays longest, lowermost five rays thickened and with slightly exserted tips. Pectoral-fin origin just below body midline, insertion on abdomen.

Mouth horizontal, subterminal. Upper jaw extending to anterior third of eye. Lower lip lobe well developed, extending from symphysis to mouth rictus. No epidermal prickles on lips or snout. Nasal tube elongate, extending well beyond upper lip when pulled forward. Oral valve moderately strong, just reaching anterior edge of vomer and coalesced with lateral margin of palate opposite rictus. Jaw teeth small, conical; dentary and premaxilla with three irregular rows of teeth anteriorly, blending into single row posteriorly. Vomerine teeth in round patch; palatine teeth in irregular row; vomerine and anterior palatine teeth larger than jaw teeth.

Cephalic lateralis pores small, rounded (Fig. 4). Five postorbital pores arising from frontal, sphenotic, pterotic, and lateral extrascapulars. Two pairs of anterior supraorbital (nasal) pores, one set mesial to nasal tube, the other posterodorsal. Seven suborbital pores, six arising from ventral ramus of bone chain, the other from ascending ramus behind eye. Eight preoperculomandibular pores, four arising from dentary, one from anguloarticular, and three from preopercle. Occipital and interorbital pores absent. Body lateral line (Fig. 5) of superficial neuromasts with ventral branch originating just behind fifth postorbital pore, mediolateral branch originating just posterior to pectoral-fin margin, and short dorsal branch of widely separated neuromasts originating just behind fifth postorbital pore and

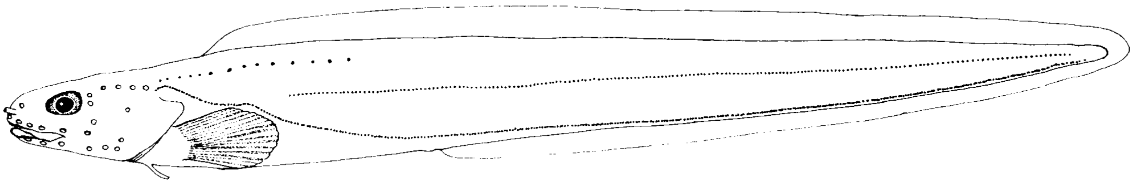

Fig. 5. *Pachycara dolichaulus* sp. nov., holotype, 244 mm SL, HUMZ 167323, off Peru. Diagram showing body lateral lines.

traceable to about one head length posterior to pectoral-fin margin. No rows of neuromasts on head.

Dorsal-fin origin associated with second vertebra, with no free pterygiophores; origin directly above pectoral base. Anal-fin origin associated with ultimate precaudal vertebra, with five ray-bearing pterygiophores inserted anterior to haemal spine of first caudal vertebra. Last dorsal ray associated with fourth preural vertebra, last anal ray associated with second preural vertebra. Caudal fin with two epural, four upper hypural, and four lower hypural rays.

All gill rakers short and pointed. Pyloric caeca two small nubs. Branchiostegal rays six, four inserted on ceratohyal, two on epihyal. Pseudobranch filaments long, slender.

Color uniformly dark chocolate brown, pectoral fins and head darker than body. Eye blue, anus ringed in white. Lining of orobranchial chamber black, peritoneum dark brown in preservative. Stomach pale (unpigmented).

Etymology. From the Greek *dolichos* (meaning long) and *aulos* (meaning tube) in reference to the unusually long nostril tube in this species; noun in apposition.

Remarks. *Pachycara dolichaulus* appears close to the northeastern Pacific *P. lepinium* Anderson and Peden, 1988. Characters the two species share include possession of ventral and mediolateral branches of the lateral line system, with the mediolateral branch originating posterior to the pectoral-fin margin and the ventral branch originating behind the last postorbital pore; an advanced dorsal-fin origin (first pterygiophore associated with vertebrae 3–5); lower limb gill rakers blunt; pelvic fins present; and precaudal vertebrae 22–26. The two species differ in *P. dolichaulus* lacking nape scales (vs. nape scales present in *P. lepinium*), its dorsal-fin origin associated with vertebra 3 (vs. vertebrae 4–5 in *P. lepinium*), five postorbital pores (vs. two or three pores in *P. lepinium*), and apparently a smaller pectoral-fin (fin length 62.9% HL in the new species vs. 72.5–89.9% HL in *P. lepinium* [cf. Anderson and Peden 1988]). In addition, the depth record of *P. dolichaulus*, 666–718 m, is among the shallowest captures for the genus, indicating it is probably an upper bathyal species, while *P. lepinium* is a lower bathyal species, captured at 1728–2970 m (Anderson and Peden 1988).

Acknowledgments

For help with logistics and curatorial needs during my visit to Japan during 2005–2006 I am grateful to Hisashi Imamura, Hokkaido University Museum, and Kazuhiro Nakaya, Mamoru Yabe, Mitsuomi Shimazaki, Kenji Odani, and Nana Yamaguchi, all of the Graduate School of Fisheries Sciences, Hokkaido University, Hakodate. Satoshi Ikeda, a student at Hokkaido University's Graduate School of Fisheries Sciences, radiographed specimens and identified all the Peruvian eelpouts. Elaine Heemstra, South African Institute of Aquatic Biodiversity, rendered the illustrations.

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